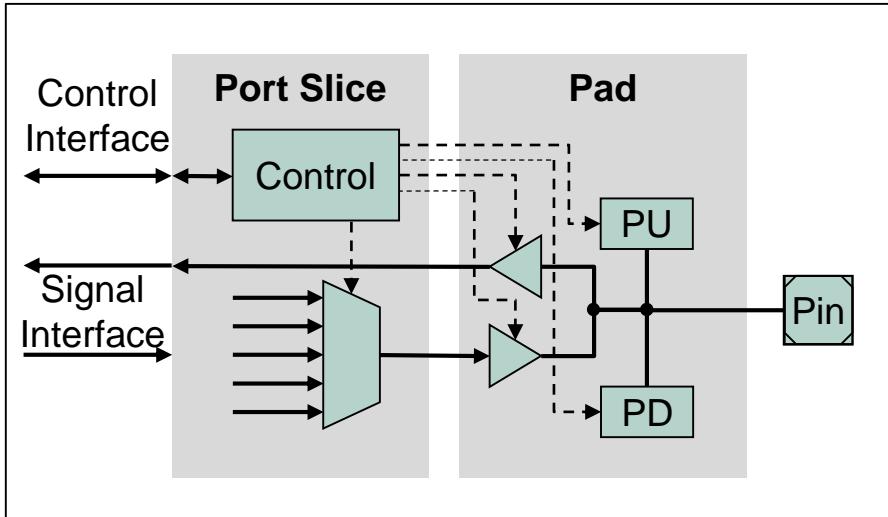# GPIO
General Purpose Input Output

AURIX™ TC2xx Microcontroller Training
V1.0 2019-03

GPIO
General Purpose Input Output

Highlights

› Digital input and output pins controlled by software or by peripherals

› Capable to drive 5 V or 3.3 V output level

› TTL or CMOS input hysteresis

› Pin toggle with one CPU instruction

Key Features

High configuration capabilities

Access protection

Port emergency stop

Customer Benefits

› Flexible adaption of pin characteristics to application needs e.g. EMC

› Protection against unintended modification of port configuration

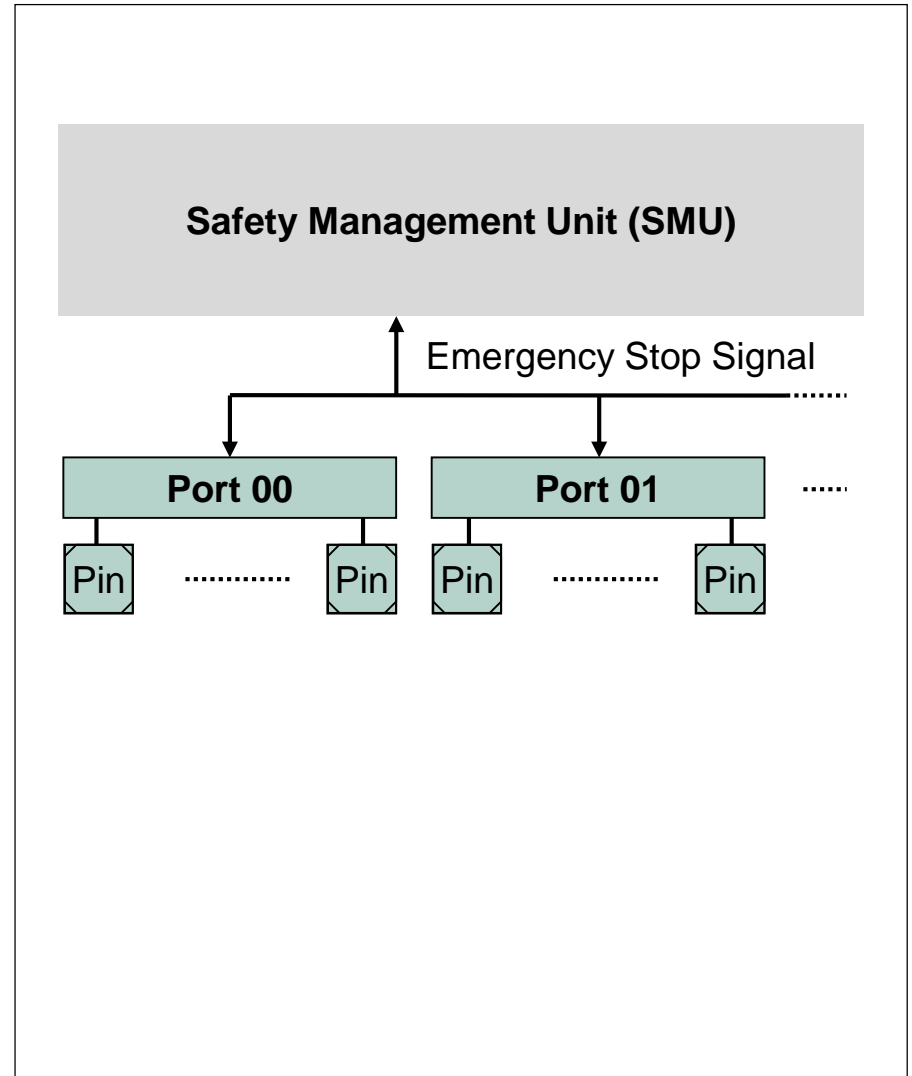› Pre-defined pin states for critical situations without software intervention

GPIO
High configuration capabilities

› Each port pin can be configured and controlled by software for input or output operation (general-purpose mode)

› A port pin can be assigned to one of 7 peripheral **outputs**

› Peripherals decide which **input** port pin to use as input

› The level of a pin can always be read by software independent of whether the port pin operates as input or output

› Configured as input:

  – an internal **pull-down** or **pull-up** devices can be connected

  – the user can select between 2 different **input hysteresis**

› Configured as output:

  – **Push-pull** mode or **open-drain** mode can be selected

  – up to 4 different **speed grades** are available to apply the optimal balance between speed needs and EMC behavior of the application
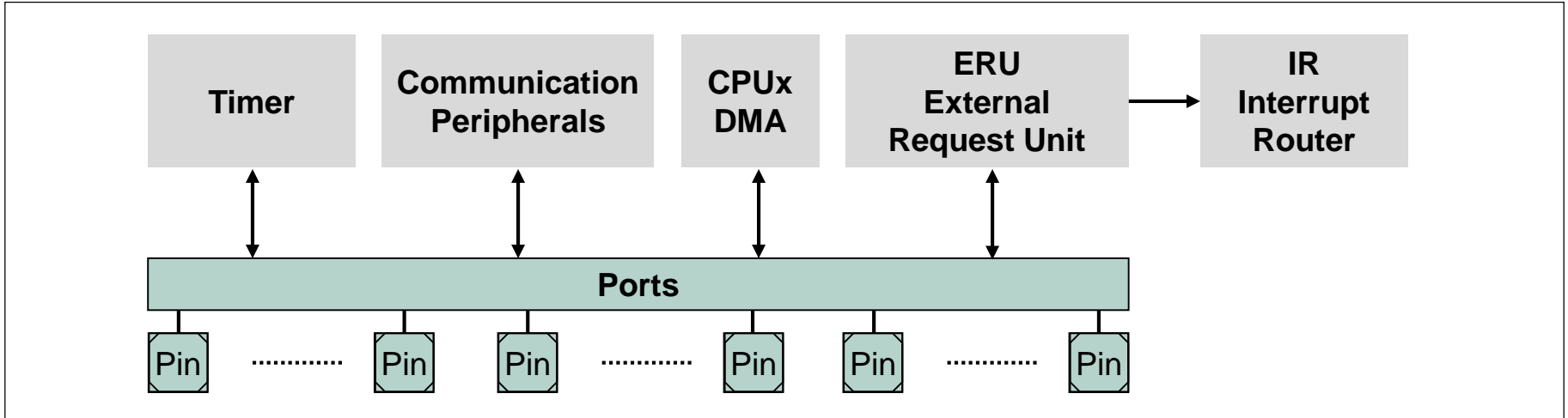
GPIO
Access protection

Example:
› CPU0 can write to Port00 only
› DMA can write to Port33 only
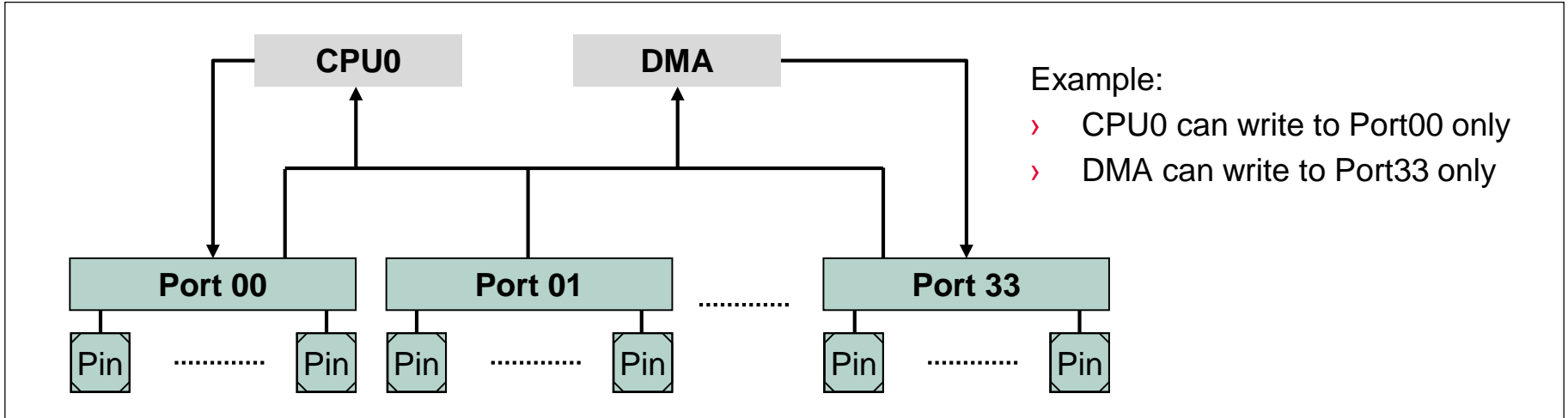
› Unintended settings of port pins could cause serious and irreversible damages of the application hardware especially in high power applications

› To avoid unintended modifications of port pin configurations during operation, AURIX™ provides a write protection for ports

– The registers group of each port (e.g. P00, P01, P33, …) can be protected against write accesses

– Write accesses can be disables separately for each bus master like e.g. CPUx, DMA, and HSSL

GPIO
Port emergency stop

› The emergency stop signal from the Safety Management Unit (SMU) forces port pins from output mode to general-purpose input mode

› Emergency stop logic can be enabled for each port pin individually
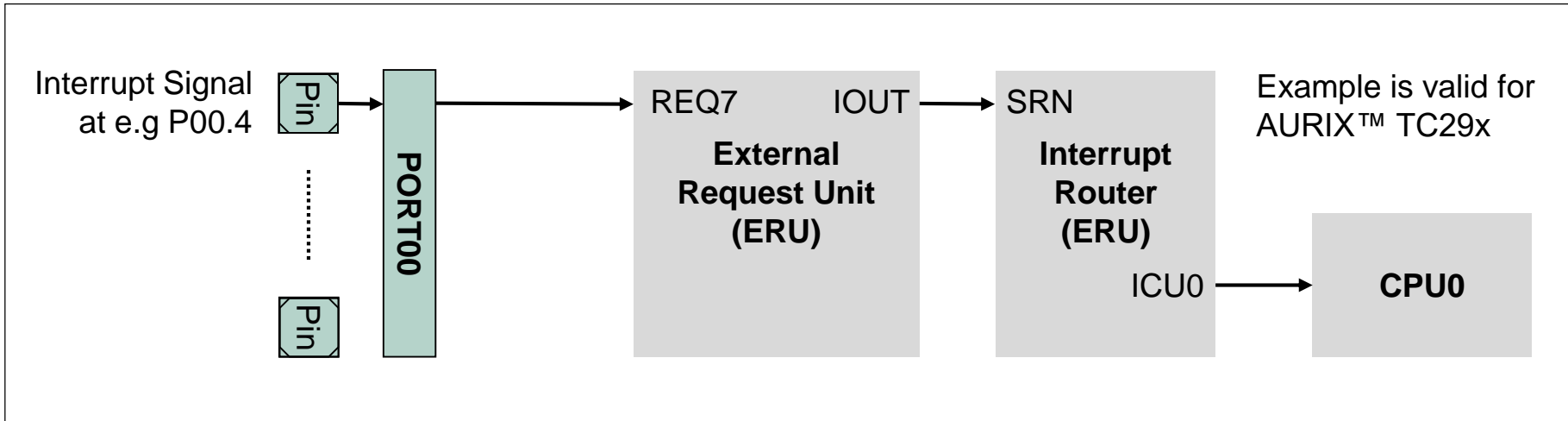
GPIO
System integration

Timer	Communication Peripherals	CPUx DMA	ERU External Request Unit	→	IR Interrupt Router

Ports

Pin ··········· Pin Pin ··········· Pin Pin ··········· Pin

› Almost all peripherals are interacting with port pins used as connection to the outside world

› External interrupt signals (service requests) can be routed via the External Request Unit (ERU) to the Interrupt Router (IR)

Application example
External interrupt

Interrupt Signal at e.g P00.4

Pin

Pin

PORT00

REQ7   IOUT

External Request Unit (ERU)

SRN

Interrupt Router (ERU)

ICU0

CPU0

Example is valid for AURIX™ TC29x

Overview

› The selected interrupt input pin P00.4 must be configured to input (optional: open drain mode, pull-device activated)

› In the ERU the input REQ7 must be selected and routed to an output

Advantages

› Several interrupt signals can be combined in the ERU and routed to one interrupt node

› Up to 16 possible external interrupt inputs

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